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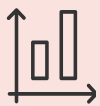
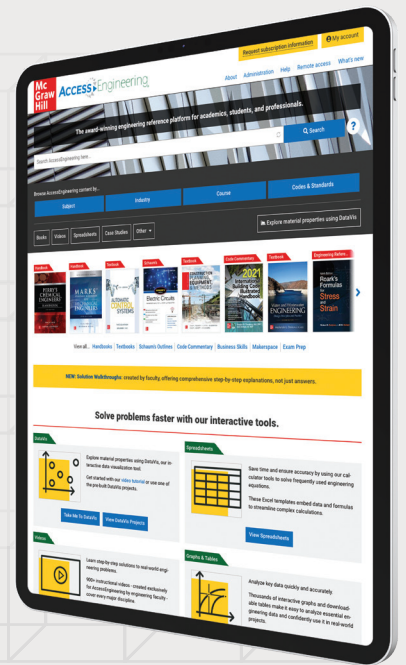
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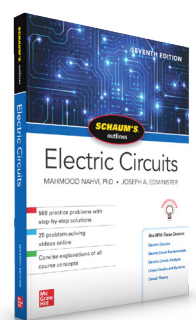
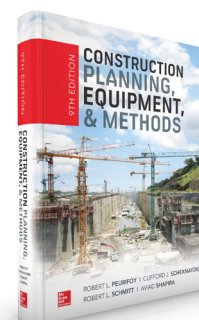
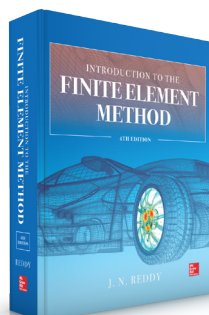
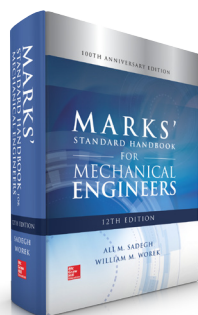
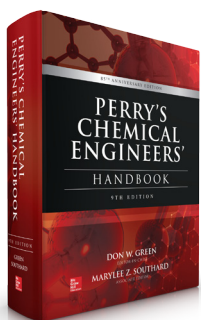


## Subject Areas

- ▶ Aerospace
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- ▶ Computer
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## Inside you'll find:

### Spreadsheet Calculators

Spreadsheet calculators save users time and reduce errors by streamlining calculations of hundreds of common engineering equations.

Activated Sludge Wastewater Treatment Calculations - U.S. units  
Aeration Tank Sizing Calculations

Parameter Values Transferred from Worksheet 2:

- Design Wastewater Flow Rate,  $Q_d$  = 1.5 MGD
- Primary Effluent BOD<sub>5</sub>,  $S_0$  = 180 mg/L
- Aeration Tank MLSS,  $X$  = 2500 mg/L
- % solids MLSS, % WS = 25%

Enter values in yellow cells only.

1. Sizing Based on Volumetric Loading

Design Vol. Loading,  $V_L$  = 10.5 lb BOD<sub>5</sub>/day/1000 ft<sup>3</sup>

Design Aeration Tank Volume

Aeration Tank Volume,  $V$  = 51,189 ft<sup>3</sup>    Air Tank Hyd. Retention Time = 4.84 hr

Air Tank Volume,  $V_{air}$  = 0.428 MG    Air Tank F/M Ratio = 0.382 lb BOD<sub>5</sub>/day/lb MLSS

2. Sizing Based on Hyd. Retention Time

Design Aeration Tank HRT = 7.0 hr

Design Aeration Tank Volume

Aeration Tank Volume,  $V$  = 55,489 ft<sup>3</sup>    Air Tank Hyd. Retention Time = 7.0 hr

Air Tank Volume,  $V_{air}$  = 0.428 MG    Air Tank F/M Ratio = 0.373 lb BOD<sub>5</sub>/day/lb MLSS

References and Equations

A flow diagram of the activated sludge process is shown below along with the equations used in this spreadsheet. For more details and background information on the activated sludge process and its design and operation calculations, use the following references:

Peter and Wastwater Engineers Design Principles and Practice, Sec 21.7, Suspended Growth Design; The Standard Handbook of Environmental Engineers, 2nd Ed, Sec 5.1, Activated Sludge; Handbook of Environmental Engineers Calculations, 2nd Ed, Sec 1.7.1, Activated Sludge Process; Design of Water Resource Recovery Facilities, 4th Ed, Sec. 12.1.3, Activated Sludge Environment

Activated Sludge Flow Diagram & Parameters

Equations Used for These Calculations:

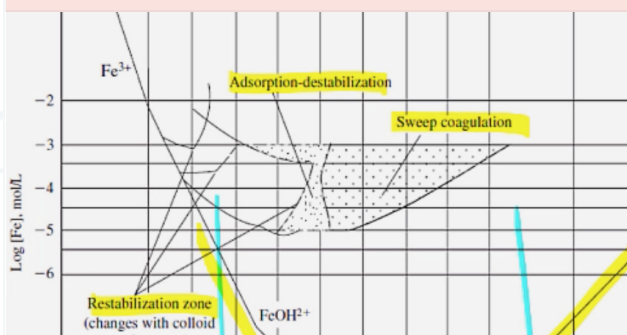
Aeration tank volume in millions of gallons:  $V_{MG} = V/2.47 \times 10^6$

Volumetric Loading:  $V_L = [18.24 \times Q_d \times S_0] / [V \times 1000]$  (lb/1000 ft<sup>3</sup>/day)

Hydraulic Loading:  $HRT = 24 \times V_{MG} / Q_d$

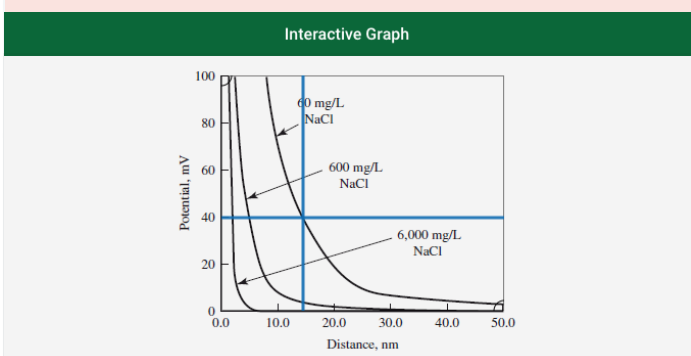
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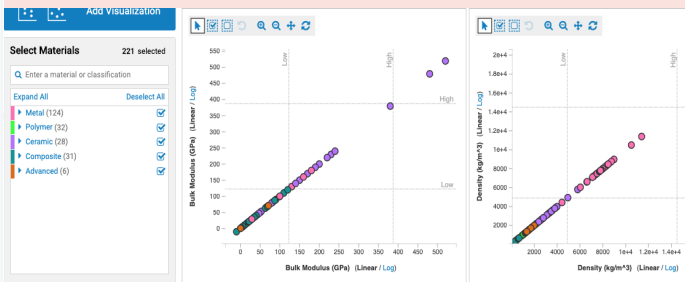
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- Fluid mechanics (20,921)
- Heat transfer (8,158)
  - Relation of heat transfer and thermodynamics (165)
  - Modes of heat transfer (742)
    - Conduction (238)

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#### Solution Walkthroughs on AccessEngineering



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AccessEngineering Case Studies are designed to be used in case method teaching, presenting real-world examples of BME and other engineering applications. Cases include questions and problems tied to specific ABET learning objectives and come with teaching notes and solutions for instructors.

#### Rotator Cuff Repair: Bridging the Gap Through Engineering Innovation

Katherine E. Reuther, Sarah I. Rooney

2020-04-08

Case Study Resources (6)

Focus View

#### INTRODUCTION

Rotator cuff tears are common conditions, affecting nearly half of the population over the age of 50. These tears can lead to significant pain and dysfunction, including deficits in strength and limitations in range of motion, while some patients remain asymptomatic. Treatment often includes surgical repair of the tear, with nearly 500,000 rotator cuff repairs being performed annually in the United States. Unfortunately, healing remains inconsistent and re-tears often occur within three months after surgical repair (up to ~90% failure rate for larger tears), resulting in return of severe pain and disability. Engineers, scientists, and clinicians have been working for several years on methods to improve rotator cuff repairs, including introduction of new surgical techniques and new devices, like suture anchors and augmentation patches.

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